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Geological Survey of Victoria.

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ON

NEW VEGETABLE FOSSILS

OF THE

AURIFEROUS DRIFTS;

BY

BARON FERDINAND VON MUELLER,

K.C.M.G., M.D., Ph.D., F.R.S., F.L.S. and F.G.S., Government Botanist.

> "CŒLI SICUT FUMUS LIQUESCENT, ET TERRA SICUT VESTIMENTUM ATTERETUR, ET HABITATORES EJUS SICUT HÆC INTERIBUNT."—*Prophetia Isaiæ, cap. li., 6.*

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OBSERVATIONS

ON

NEW VEGETABLE FOSSILS OF THE AURIFEROUS DRIFTS,

By BARON FERD. VON MUELLER,

K.C.M.G., Ph.D., M.D., F.R.S., F.G.S., Government Botanist for Victoria.

XYLOCARYON.

F. v. M. in Reports of the Mining Surveyors and Registrars, June 1875.

Fruit large, globular, unilocular, one-seeded, wrinkled and foveolar-impressed. Pericarp of very thick woody consistence, with five to six very prominent obtuse longitudinal ridges protruding into the cavity. Seed large, lengthwise sinuously five- or six-lobed by the intrusions of the pericarp, closely fitted to the cavity. Testa smooth.

Derivation of the systematic name from ξυλον, wood and καρυον, nut.

XYLOCARYON LOCKII.

In sedimentary strata at Nintingbool, probably of the lower pliocene state. J. Lynch, Esq.

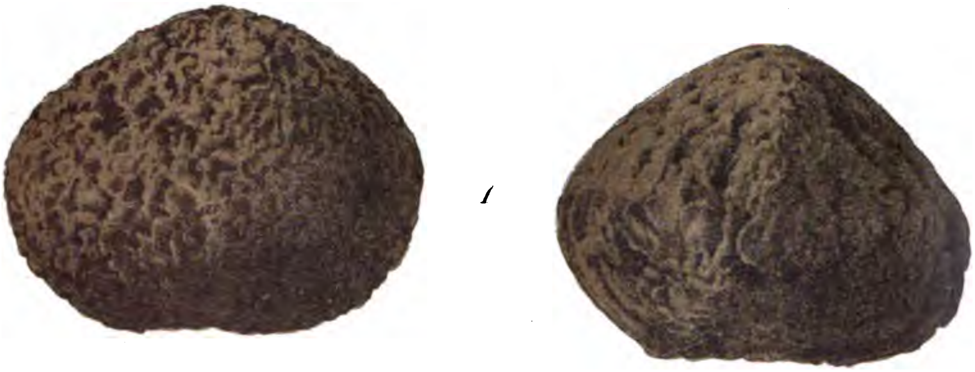
The whole material, on which the description and also Major Shepherd's drawing are founded, consists of two specimens of the fruit solely. As may be noted from the lithographic illustration, these fruits measure fully 2 inches across, and rather more in length. The average thickness of the pericarp is ½ inch; but where it passes into the cavity and penetrates the seed its width attains to 1 inch. The seed, though closely pressed into the cavity, seems free, except at one extremity; but as no remnant of the fruit-stalk or its cicatrix remains observable on the specimens hitherto gathered, the position of the seed, whether erect or inverse, cannot as yet be determined. The seed in its widest diameter measures nearly 1½ inch, and its height about the same. Its lobes are considerably or very much broader than the sinuosities and very blunt, but they become evanescent towards the upper and lower extremities; the pericarpal processes penetrate the seed to nearly one-half its width, or even more. The testa is externally smooth; it seems to have been crustaceous; but by prior infiltration it is internally densely beset in our two specimens with a stratum of bisulphide of iron. As in most fossil seeds, so also in this instance, the embryonic structure and the presence or absence of the albuminous body remain unascertainable.

This grand fruit of probably a large tree of a long bygone age was dedicated to the late R. H. Lock, Esq., who with enlightened views was among the very first to draw attention to the Nintingbool fossils, and to cause them to be secured for palæontographic elucidation.

It might be added, that the genus Xylocaryon would probably best find a place in any systematic arrangement among Olacineæ, of which order as yet no member stands on palæontologic record. Should this conjecture be borne out by future disclosures from more instructive material, then Xylocaryon would take its place in the systematic series near Phlebocalymma (Griffith, in Bentham et Hooker's Genera Plantarum, i. 353) of which Indian genus a new representative has been detected in Queensland (F. v. Mueller, Fragmenta Phytographiæ Australiæ, ix. 151). Affinity would also draw our fossil near to Gonocaryum (Miquel, Prodromus Floræ Sumatranæ, 343), the fruit of which has recently been described by Dr. Scheffer (Annales du Jardin Botanique de Buitenzorg, i. 13), the close relationship between Gonocaryum and Villaresia being thus established.

In the locality of discovery this new fossil was accompanied by many of the fruits, previously obtained from the Nintingbool-layers; thus by Spondylostrobus Smythii (which there, though very rarely, produces a trimerous cone), by Conchotheca rotundata, by a six-valved variety of Penteune brachyclinis, by P. trachyclinis (which latter in its though rare four-valved fruit bears much resemblance to Phymatocaryon Mackayi), then by the last-mentioned fossil, also by Platycoila Sullivani and Rhytidotheca Lynchii (in which latter, according to the position of the seeds for their wing-like expansion on one side no space is left); but according to the present sending a far more copious mass of Celyphina MacCoyi and Plesiocapparis prisca associates with the Xylocaryon; while forms both of Celyphina and Plesiocapparis do occur, which give to each other, as also to the Xylocaryon, a mutual external similarity, although the comparatively brittle shell and the ridgeless cavity of the two former exhibit wide distinctions from the still thicker, tough and not fragile pericarp and the sinuous short subdivisions of the Xylocaryon-fruit. It is indeed not always easy to discriminate between varieties of Celyphina with larger and also turgid fruits in comparison with smaller forms of the fruit of Plesiocapparis. In the former, however, the cavity is always of much less width, the pericarp of greater thickness with a more or less manifest tendency to compression, which could not have arisen from mechanic or accidental pressure alone. The seeds of Celyphina are still unknown; but the Plesiocapparis-fruit has now been found to contain a pulpy mass; whether this pulp was analogous to

Plate XI



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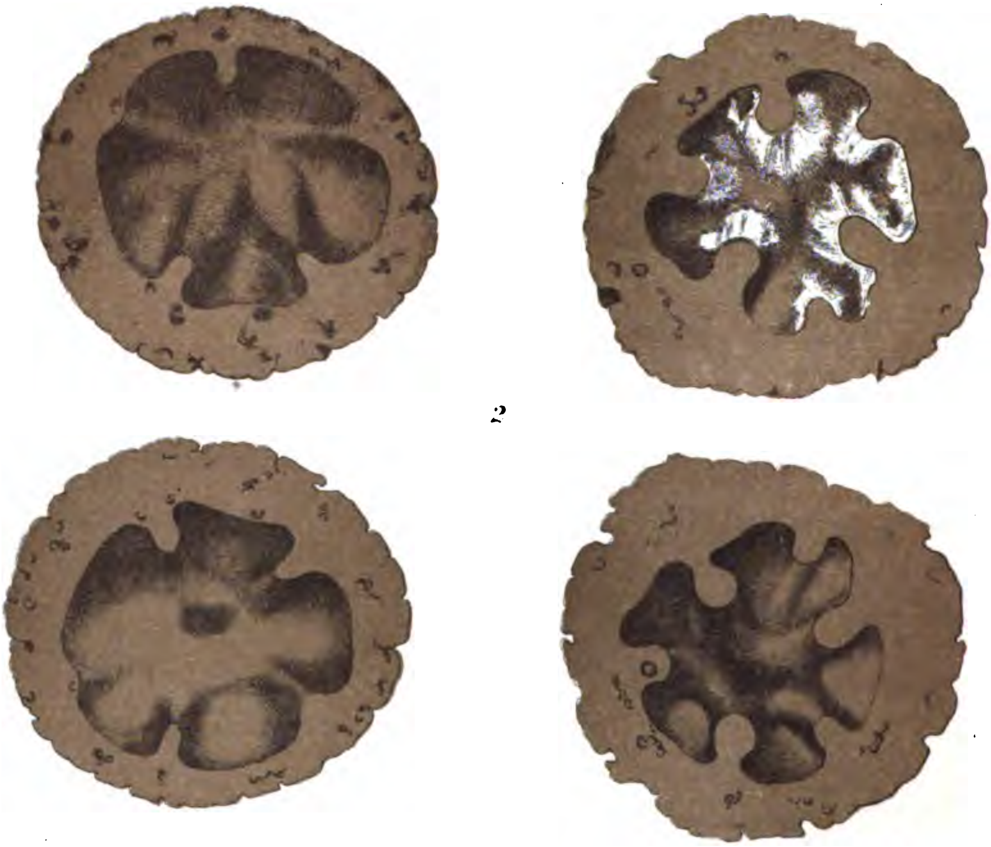

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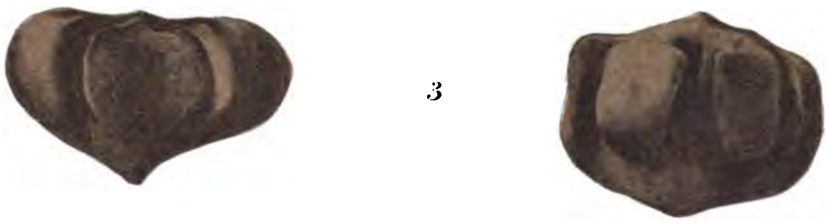

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R Shepherd Del et Lith

that of the Capers or is merely the result of decomposition of one or more large and perhaps soft seeds, which may have been the only ones coming normally to maturity, remains to be further investigated, and therewith also the validity of the temporary position of Plesiocapparis among Capparideæ. For this purpose specimens from a locality, where they were subjected to no protracted submersion in watery layers of soil, would likely give the safest results. Some of the fruits of Spondylostrobus, brought to light on the present occasion, are of enormous size; when the surface of these is smoothened by detritus, then it is only through dissection and the microscopic examination of the woody tissue, that the Spondylostrobus cone can be readily distinguished from small and equally water-worn forms of Plesiocapparis and even Celyphina. Attention to this is purposely directed here, because the miners, who may be anxious to add thus far to our palæontologic collections, may possibly deem three or more perfectly distinct fossils, which by mollification or external abrasion have become disguised, as absolutely identical.

By the aid of this new disinterment of fossil fruits the remarkable fact seems established, which to some extent was elicited already by former sendings, that the range of *variability* in reference to the *size of these fruits*, but not in regard to their structure, was much greater than is observed in cognate now living plants; and a clime would seem to be thereby indicated at the earliest pliocene age, or possibly at the last miocene times, singularly genial for admitting of an unusually exuberant development of the trees, at least so far as their fruits are concerned, during that now comparatively remote epoch.

EXPLANATION OF LITHOGRAM.

PLATE XI.

Fig. 1, side-views of the whole fruit. Fig. 2, transverse section of the same. Fig. 3, seeds. All natural size.

RHYTIDOCARYON.

F. v. M. in Annual Report of the Department of Mines of New South Wales, 1875, p. 124, pl. I.

Fruit spherical or slightly ovate, not distinctly dehiscent, one-seeded, with an oblique basal or slightly lateral attachment, woody or bony, externally wrinkled and somewhat tuberculate. Septum large, placenta-like, erect or slightly ascending from the bottom of the cavity, consisting of two portions, both smooth, turgid, oblique ovate or sometimes broadly clavate or roundish, always more or less contracted at the base, mutually connate at the middle, rounded at the edges, broadly adnate to the lateral parts of the cavity, free from its summit. Seed cylindrical, bent around the placental or septal protrusion, oblique orbicular- or ovate-hippocrepical in outline, with a marginal furrow. Testa thin, brittle, smooth.

RHYTIDOCARYON WILKINSONII.

Beneree, under basalt, at a depth of 110 feet; Mr. Edward Farr; communicated by Mr. C. S. Wilkinson. Found also between Carcoar and Orange, by the Rev.

W. B. Clarke, M.A., F.R.S. Fruits, constituting probably separate carpels of a tricoccous fructification, from ⅔ to rather above 1 inch long, externally uneven from somewhat irregular slightly concentric ridges, which are often broken up into short tubercules approaching in roughness somewhat to those of Phymatocaryon Mackayi, probably covered originally by a pulpy pericarp, which in decay would early perish, thus the nut-like covering constituting a putamen or endocarp; a very faint cleavage at the base, but no trace of valvular dehiscence; septal process from less than double to nearly triple the width of the walls of the endocarp, except the base and back free from the cavity. Seeds (in all specimens under examination) perished, but their form recognized from the space left for their reception between the dissepiment and the inner faces of the endocarp; remnants of the testa not showing any indications to intrusions into the albumen. The latter and the embryo unknown.

This new fossil, so far as I can judge from the material transmitted to me, brings before us for the first time with certainty a member of the Menispermeæ among the vegetation of bygone creations, inasmuch as of this order hitherto only the altogether doubtful genus McClintockia (Heer, die Fossile der Polarländer, 114–116; Schimper, Traité de Paléontologie Végétale, iii. 83–84, pl. xcviii.) became palæontologically recorded. Unacquainted as we are with the flowers and the embryonic characters of the fruit, we must regard it unsafe, to place this into any of the numerous genera of Menispermeæ, distinguished mainly by their floral organisation and the inner structure of their fruit; but the endocarp and septal protuberance show some resemblance to the South Asiatic genera Hypserpa (Miers, in Annals of Natural History, sec. ser. vii. 40), Limacia and Nephroica (Laureiro Flora Cochinchinensis, 620 et 692) and the East Australian Sarcopetalum (F. v. M., Plants indigenous to the Colony of Victoria, i. 27, pl. iii. Suppl.). The putamen however is more rough than that of any of these genera, and indeed conspicuously thicker than that of any living menispermaceous plant known to me, whilst in its great size the fruit of Rhytidocaryon shows only similarity (and in this respect merely) to Hæmatocarpus (Miers' Contributions to Botany, iii. 324, t. 134). The leaves are unknown. It is probable that the plant, yielding these fruits, formed like most of the menispermaceous order a climbing shrub.

EXPLANATION OF LITHOGRAM.

PLATE XII.

RHYTIDOCARYON WILKINSONII (Figs. 1, 2, 3).—Fig. 1*a*, anterior view of fruit. Fig. 1*b*, view of summit of fruit. Fig. 1*c*, dorsal view. Figs. 2*a*, 2*b*, anterior and posterior views of larger fruit. Fig. 2*c*, side-view. Fig. 2*d*, interior view, exhibiting cavity and condyle. Figs. 3*a*, 3*b*, interior of smaller variety of fruit, showing cavity and condyles. Fig. 3*c*, side view. Figs. 3*d*, 3*e*, anterior and posterior views.

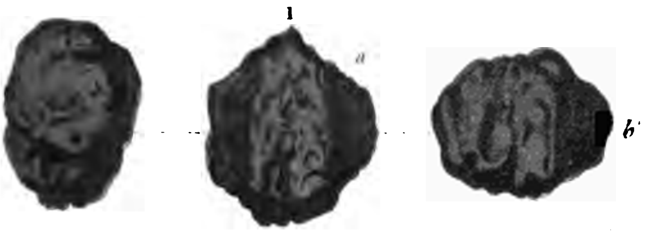
Figures drawn according to natural dimensions.

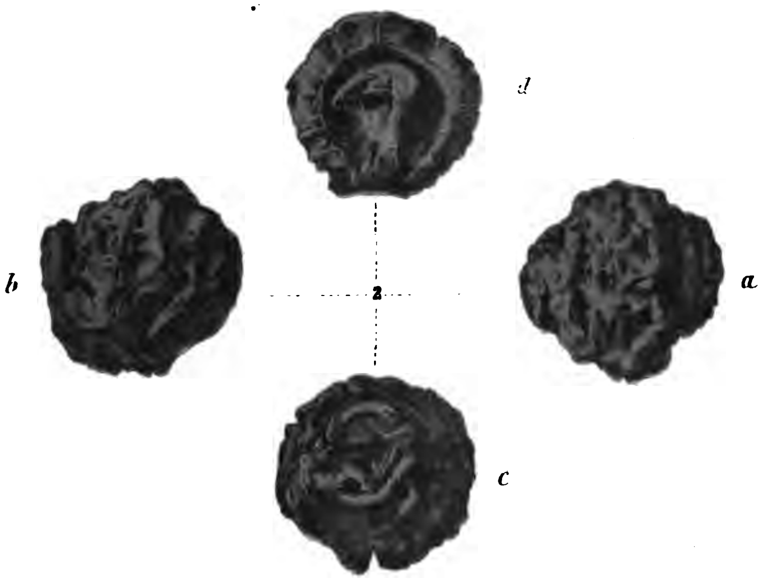
WILKINSONIA.

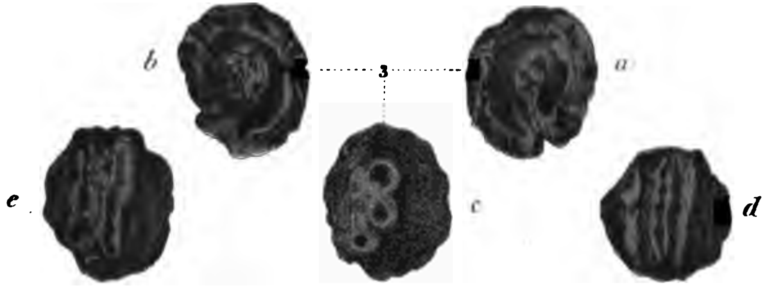
F. v. M. in Reports of the Mining Surveyors and Registrars, September 1877.

Fruit completely bivalved, one-celled, almost orbicular, more or less truncate, strongly compressed, nearly flat, irregularly traversed by several longitudinal prominent somewhat anastomosing ridges. Seed seemingly

Plate XII







R. Shepherd Del & Lith

Plate XIII

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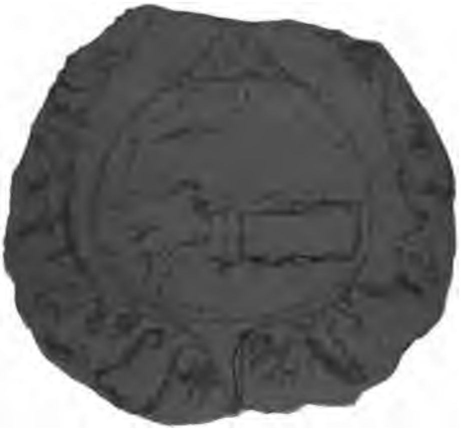

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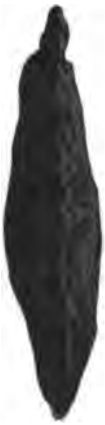

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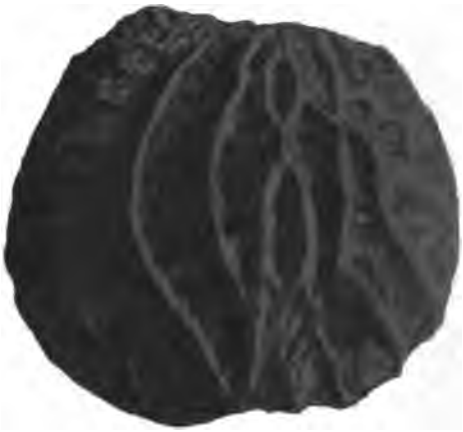

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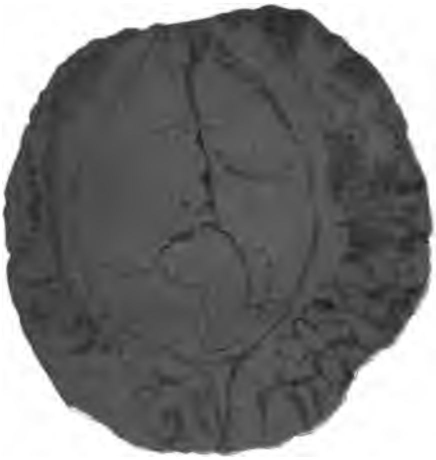

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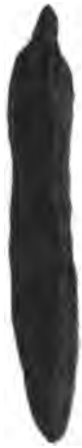

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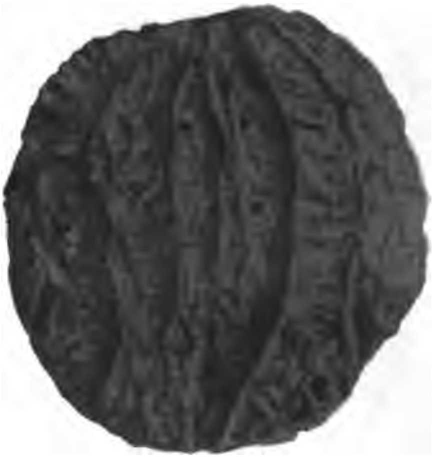

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only one, flat, roundish, occupying fully half the space of the valves; its embryonic structure not yet ascertained.

WILKINSONIA BILAMINATA.

At a depth of about 110–130 feet under basalt at Beneree, C. S. Wilkinson, Esq. and E. Farr, Esq.; in the black lead of Gulgong, 140–175 feet deep beneath a layer (15 feet thick) of basalt, Charles E. Barnard, M.D., F.L.S.

The first specimens of this remarkable fossil were obtained through the circumspect exertions of the Government Geologist of New South Wales, C. S. Wilkinson, Esq., F.G.S., through whose departmental action also many other palæontologic relics of the sister-colony became known. Some of the first discovered specimens of this apparently rare fossil were hardly half the size of those, kindly transmitted by Dr. Barnard, the dimensions of which may be estimated from Major Shepherd's excellent lithograms. The form verges rarely into oval; one of the valves is occasionally more convex than the other. The ramified main-ridges number usually six, they are sometimes slightly flexuous; the interstices, formed by the reticulations, constitute often deep impressions; the edge of the valves acutely attenuated; the laminæ closely appressed to each other, the exterior ridges nearer to the next than to the margin, and from these lesser elevations radiating. Seed closely filling the shallow cavity, in large specimens measuring rather above one inch in length and breadth; its substance too much decayed in the samples hitherto examined, to ascertain the mode of attachment. The peduncular or pedicellar cicatrix also not yet observed, to arrive at a knowledge of the relative position of the seed.

The plant, producing this remarkable fruit, may perhaps have belonged to the order of Sapindaceæ; but with the material at present available it is impossible to fix its exact ordinal position, as no external resemblance indicates any close relationship to existing genera. Some similarity to a small ostreoid shell renders the genus Wilkinsonia readily recognized among other fossils. It has received a record in the documents of the Victorian Mines Department, though not yet found in our colony; because as this plant proves to be coeval to the series, published by us here, it is likely, that also this new addition will be traced yet to localities within our colony. It is thus also probable, that the fossil treasures of that particular tertiary period, the upper pliocene, to which we have added already many significant forms, are as yet by no means exhausted by our searches.

EXPLANATION OF LITHOGRAM.

PLATE XIII.

Figs. 1 and 2, side-view of fruit. Figs. 3 and 4, marginal view of the same. Figs. 5 and 6, inner faces of the fruit, exhibiting also the seed. All natural size.

TRICOILOCARYON.

F. v. M. in Reports of Mining Surveyors and Registrars, March 1878.

Fruit hard, globular, pointed at both extremities, three-celled, indehiscent; cavities narrow, parallel to the periphery; seeds solitary in each cell, ovate, acute, compressed, smooth.

Derivation of the generic name from τρεις, κοιλος and καρυον, in allusion to the three-celled nut-like fruit.

The discovery of foliage and particularly flowers of Tricoilocaryon (if it could be effected), though such in all instances are so perishable and so difficult to match, would place the real affinity of this new genus hereafter in a clearer light. Meanwhile it is important to turn organic relics like these at once to palæontologic account, with a view of aiding mining operations in the recognition of the sediments, to which this form of bygone vegetation did belong.

The relation of the genera Tricoilocaryon and Pentacoila to Spondylostrobus needs yet to be traced; when fruits of the latter remain covered by water for some time, after they became dislodged from the dry sediments through mining operations, the cones are apt to assume an almost pulpy softness, the organic distinction between valves and axis gets obliterated, and the fruit in that state may readily be taken for a sort of berry with five or a lesser number of seeds; the form of the latter and their position towards the central portion of the axis would indicate, whether such an apparently baccate fruit was merely a mollified state of a Spondylostrobus-cone.

TRICOILOCARYON BARNARDI.

In the pliocene drifts, deep under basalt, near Gulgong; Charl. E. Barnard, M.D.

Fruit about 1⅓ inch long, and nearly as broad, externally somewhat rough and wrinkled, inside solid from hardened parenchyma; the three cavities many times narrower than the diameter of the fruit. Seeds about half an inch long, three lines broad, and in thickness hardly exceeding one line.

EXPLANATION OF LITHOGRAM.

PLATE XIV.

TRICOILOCARYON BARNARDI.—Fig. 1, whole fruit. Fig. 2, transverse section of fruit. Fig. 3, seeds, one presenting its side, the other one its edge. Fig. 4, cellular tissue from the inner portion of the fruit. Figs. 1–3, natural size; fig. 4, diametrically 250 times magnified.

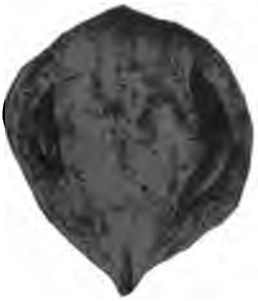
EISOTHECARYON.

F. v. M. in Annual Report of the Department of Mines of New South Wales 1878, p. 169, pl. III., fig. 2.

Fruit bony, globular or verging into an oval form, slightly depressed or compressed, faintly wrinkled outside, indehiscent or in age slightly bivalvular towards the summit; septum intruding longitudinally and from one side only into the cavity, reaching the middle of the fruit, very much compressed towards the wall, but turgid towards the centre of the cavity; seed unknown.

I prefer placing this new fossil into a genus, established for it, rather than regarding it merely as a species of the genus Villaresia of the living

Plate XIV



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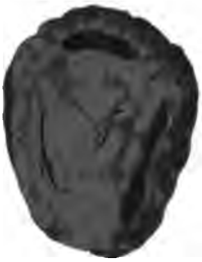

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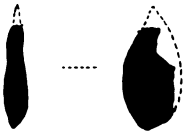

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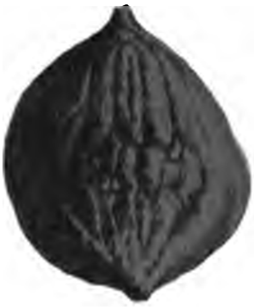

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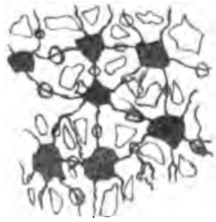

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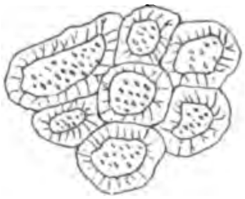

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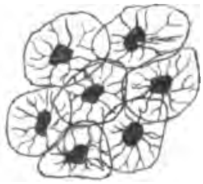

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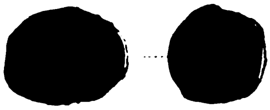
R.Shepherd Del et Lith

Plate XV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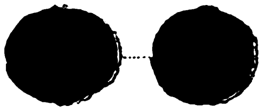
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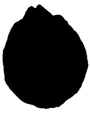
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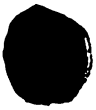
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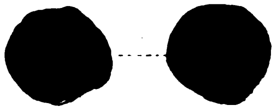
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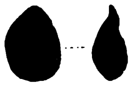
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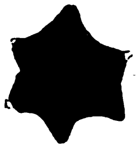
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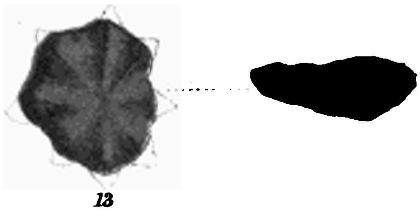
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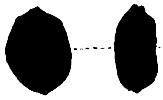
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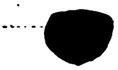
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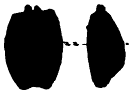
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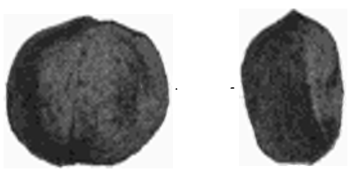
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R Shepherd Del et Lith.

creation, although the occurrence of two Villaresias in Eastern Australia at the present day may strengthen the assumption of its having been represented likewise during the Pliocene period. If however the view (held by many) should be adopted also in this instance, that the congruency of merely one organ of a fossil plant with that of a living one ought to suffice for establishing generic identity, then accordingly this new fossil should find its systematic location in Villaresia.

EISOTHECARYON SEMISEPTATUM.

Fruit measuring from nearly one-half inch to three-quarters of an inch, oftener blunt than pointed; the turgid portion of the dissepiment somewhat hollow along its centre; seed unknown, but in all likelihood curved around the septum. A record of this and the four following fossils, together with some others, appeared already in the Report of the New South Wales Department of Mines for 1876, p. 178–180, from specimens found in the Upper Pliocene layers at Gulgong by C. S. Wilkinson, Esq., Government Geologist of New South Wales. The descriptions, then given by me, were however not accompanied by any figures, which are so essential to aid in the recognition of the particular species of plants now only fossil, in which, as a rule, the structure of the embryo and many other important details can no longer be traced for descriptive diagnosis. The illustrations here offered emanated from the tried skill of Major Shepherd, and will thus greatly facilitate the recognition of any of the specific forms now under review. It was deemed desirable, to give to these new fossils a place also in the series of Victorian species, although as yet they have not been discovered actually within the boundaries of our colony; but inasmuch as at Gulgong all these new species are associated with many others, which do occur in the Upper Pliocene formation of Victoria also, it may be safely inferred, that they belonged all to a complex of silvan vegetation in past ages of wide distribution through the territory now occupied by both colonies.

EXPLANATION OF LITHOGRAM.

PLATE XV.

Fig. 1, front- and side-view of the fruit. Fig. 2, longitudinal section of the same. Fig. 3, transverse section of the same. Fig. 4, a fruit showing imperfect dehiscence. Fig. 5, longitudinal section of the same. All natural size.

PHYMATOCARYON BIVALVE.

F. v. M. in Annual Report of the Department of Mines of New South Wales, 1878, p. 170, pl. III., fig. 2.

Fruit roundish, much compressed, bivalved, two-celled, blunt or slightly protracted at the extremities, almost smooth or but slightly tubercular outside, the valves diverging finally from near their base, one of the cells only seed-bearing or more rarely a seed in each cell developed. Seed exceeding half the length of the valve, oblique-oval, somewhat pointed.

This species differs from P. angulare in having merely two valves, which moreover are more acute at the edge. Unacquainted as we are with the foliage and flowers of the plants, which yielded these fruits, we are justified in treating them at present, as if they belonged to one genus. Instances of a similar resemblance are afforded in the living vegetation by many genera, such as Pittosporum and Celastrus, in which different species occur with two or more fruit-valves. Specimens were submitted also by the Rev. Jul. Tenison-Woods, F.G.S., in some of which the valves showed a verrucular-roughness; from Nintingbool a variety of quite an oval form was obtained; among the samples from thence occurred also what seems a curious deformity, in which one of the valves, possibly through pressure, became protracted into a wedge-shaped turbinate form.

Explanation of Lithogram.

Plate XV.

Fig. 6, front- and side-view of a fruit. Fig. 7, longitudinal section of the same. Fig. 8, a smaller fruit, laid open longitudinally. Fig. 9, front- and side-view of a seed. All natural size.

ILLICITES.

F. v. M. in Annual Report of the Department of Mines of New South Wales, 1878, p. 171, pl. IV., figs. 3, 4.

Fruit starlike expanded, consisting of 6–8 carpels; these radiating in one series, connate towards their base, free towards the summit and gradually pointed, almost flat on the lower side, very convex on the upper side, there longitudinally dehiscent, outside wrinkled and streaked as well as slightly granular-rough; vertex of the axis excavated. Seeds unknown.

So far as the very scanty material for examination extends, it might induce us to place this organic relic near the genus Illicium of the living creation, but as nowhere else any species of that genus has hitherto been found among fossils, it was regarded as safer, to frame a separate generic name of similar wording, in accordance with palæontographic usage, for the fossil allied plant. Flowers and foliage, as well as perfect seeds, would also be needed, to establish for this fossil an undisputed position in or near the living genus. As an addition to the Magnoliaceæ of past geologic periods this plant is of particular interest, fossil remnants only of the genera Magnolia and Liriodendron being hitherto on record from this order, and these again mainly of the cretaceous epoch, if indeed their generic recognition was always free of doubt, their description resting often on leaves merely. So also very recently Professor Lesquereux defines anew some supposed Magnolias from leaf-fragments alone in Dr. Hayden's superb series of volumes on the United States geologic survey (Vol. VII., 247–250, t. XLIV. and XLV.). But however valuable these records of fossil foliage may be for aid in defining the age of geologic sediments, yet in most instances the evidence hitherto brought forward does not prove conclusively the generic or even ordinal recognition of such relics. By the aid of the microscope we may yet hope to be able to obtain characteristics of diagnostic value from the anatomy of leaves sufficiently positive to recognize ordinal and even perhaps generic groups. But unfortunately very often in fossil leaves the delicate cell-walls and the tender membranes of their vascular structure are too much destroyed for obtaining thus far objects for the compound microscope, otherwise we should have a powerful auxiliary for settling the affinity of many obscure remains of plants. How far this can be done even with living plants remains yet to be extensively studied; but I was enabled for instance, to demonstrate the occurrence of Epacrideæ in New Guinea from the microscopic comparison of the leaf-epidermis of a species, brought from thence without flowers and fruits, with the very peculiar cuticle of many Epacrideæ easily recognized microscopically.

ILLICITES ASTROCARPA.

Diameter of fruit one-half to one inch, height very much less; in one specimen, smaller than those figured but much deformed, the acute radiating points are well preserved.

EXPLANATION OF LITHOGRAM.

PLATE XV.

Figs. 10 and 13, fruit seen from above, the points partly worn away. Figs. 11 and 14, lateral view of fruit. Fig. 12, longitudinal section of the same. All natural size.

PLEIACRON.

F. v. M. in Reports of the Mining Surveyors and Registrars, September 1878.

Fruit small, bony, ovate, smooth, truncate at the summit, terminated by four or six tooth-like short protrusions, 4–6-celled, indehiscent. Seeds solitary in each cell, clavate-ellipsoid, the narrow end upwards.

PLEIACRON ELACHOCARPUM.

Fruit only about half-an-inch long or less; the impression of the summit shallow, the teeth almost blunt; a short perforation at the base; cells stretching along the whole length of the fruit. Mode of attachment of the seed not yet ascertained. In the original description a form with four cells was regarded as typical, possibly that with six cells and six teeth may prove specifically distinct. The latter was found to be provided with a short and very thin stalklet. The species had to be described from a solitary specimen of each form, not well preserved either. Not only of Pleiacron but also of the four other genera now illustrated, additional material has to be searched for, to improve upon this first attempt of assigning to them systematic limits.

EXPLANATION OF LITHOGRAM.

PLATE XV.

Fig. 15, front- and side-view of a fruit, natural size. Fig. 16, transverse section of the same, natural size. Fig. 17, front- and side-view of the 4-celled form, natural size. Fig. 18, summit of the same, magnified.

PENTACOILA.

F. v. M. in Reports of the Mining Surveyors and Registrars, September 1878.

Fruit bony, compressed-globular, indehiscent, slightly rough outside, five-celled. Seed solitary in each cell, oval, compressed. Its nearest affinity, so far as can be judged from fruit alone, seems to be with Tricoilocaryon.

PENTACOILA GULGONGENSIS.

Fruit nearly or fully an inch in length, perhaps hardened only by fossilification; cavities rather narrow, their walls smooth.

EXPLANATION OF LITHOGRAM.
PLATE XV.

Fig. 19, front- and side-view of a fruit. Fig. 20, transverse section of the same. Natural size.

PLESIOCAPPARIS MEGASPERMA.

F. v. M. in Reports of the Mining Surveyors and Registrars, December 1878.

Fruit globular, neither compressed nor oblique; pericarp very thin, outside almost smooth; seed solitary, very large, globular; cotyledons hemispherical; radicle ovate, very minute, enclosed.

In Pliocene drifts, vastly overflown by basalt, near Gulgong; Chas. Barnard, M.D.

The few specimens seen measure about 1½ inch and are very faintly wrinkled and rough outside. The thickness of the pericarp varies from ¾ to 1½ line; a slightly prominent and gradually evanescent line passing upwards along less than half of the fruit or extending on both sides nearly to its summit. Seed about 1 inch in diameter; its mode of attachment no longer traceable. Cotyledons easily separating from each other and from the endopleura, homogenous, wrinkled merely by exsiccation; radicle about 1 line long.

When the genus Celyphina (in the absence of seeds with much diffidence) was established, I alluded already to its probable affinity with Helicia; if the discovery of the seeds should bear out hereafter this view, then Celyphina may as a genus become the receptacle also of our new fossil. Externally a great resemblance to Plesiocapparis leptocelyphis is evident at a glance, and the question arises, whether the seeds, figured in first instance, are only ovules advanced in growth, of which one only comes to maturity and then almost fills the whole cavity.

The fact, that in Plesiocapparis several of the seeds (resembling somewhat those of capers) attain a considerable size and are not early suppressed, as is mostly the case in pluri-ovulate but one-seeded fruits, would speak against the generic union, notwithstanding the singular external resemblance of the fossil now under review. Macadamia, to which it verges so closely, produces only two ovules, of which usually only one matures; its radicle is minute and enclosed just as in our fossil fruit; we should thus almost be justified in establishing for the latter a separate generic name (Helicites). "Veritas potius e praevia separatione quam festina unione." On the other side it cannot be denied, that Melicocca among Sapindaceæ exhibits many carpologic characteristics, which agree with the fossil now temporarily placed in Plesiocapparis, although the latter generic name, as indicating a very different alliance, does not apply to this new species or form. The affinity to some rosaceous genera (for instance Pygeum), to some meliaceous, sapotaceous and laurinaceous genera, several of which offer great embryonic resemblance, seems to be more remote.

SPONDYLOSTROBUS SMYTHII.

Through the circumspect exertions of Mr. Rob. Johnston, of Launceston, F.L.S., whose enquiries into the geology of some portions of Tasmania are well appreciated since years, I came into the possession of several vegetable fossils from thence, and thus received recently also the drawing of some cupressoid foliage from a place, where fruits of Spondylostrobus Smythii were obtained. This locality is on a small watercourse flowing into the Tamar opposite Georgetown, since famous through the discovery of gold in drifts as well as in rich quartz-reefs. These new goldfields furnish also some other fossil vegetable species, which are indicative of auriferous country in Victoria, New South Wales and Queensland, though in Tasmania these organic relics remained so singularly long concealed.

As hitherto only one single species of coniferous plants has been noted in the gold-drifts, it was to me at once apparent, that at last the foliage of Spondylostrobus had been discovered. The delineation, made from the original impression (the clayey soil since crumbled into dust), did not show with exactitude the numerical arrangement of the leaves in the whorls. In questioning the finder, whether it might have been *quinary*, he at once replied, that he remembered it to have been such. With this confirmation of what I anticipated, there can now be no longer any reasonable doubt as to this foliage belonging to the same species, which furnishes the fruit described as that of the genus Spondylostrobus. This foliage by the quinary arrangement of its scale-like leaves bears out the symmetry noticed between the number of leaves in a whorl and the numerical fruit divisions of several cupressinous genera. So in Frenela and its subgenus Actinostrobus we find a ternary disposition of the minute leaves combined with a double and usually unequal whorl of ternary fruit-scales, the bracts of the male flowers and mostly also the anthers being placed likewise ternately, while the embryo is also frequently tricotyledonous. In Octoclinis quaternary leaves are normally connected with eight fruit-scales, the latter in two slightly unequal sets. Callitris shows leaves and bracts opposite in single pairs, while the fruit-valves form a double pair, one pair only seed-bearing, whereas the anthers are mostly grouped in four and the two cotyledons two-cleft. In Libocedrus we find as a rule similar numeric proportions. Under these circumstances, though the evidence is not connectedly direct but only circumstantial, we may be justified in uniting the foliage now illustrated with Spondylostrobus-fruit. The drawing here offered is from a sketch of Mr. Johnston, but Major Shepherd has added in dotted lines on the enlarged figure the lost portions of the quinary leaves.

Attention now being directed to the cypress-like leaves of this isolated fossil conifer, it will doubtless soon be found elsewhere. In all probability also the fossil pine-wood, gathered at the localities, at which Spondylostrobus-fruits were obtained, will prove conspecific. The geologic structure of the country, where in

Tasmania (at the Union Gold Mining Company's ground) this fossil conifer occurs, is described by Mr. Johnston and Mr. Stockman as follows: Surface-clay, 7 feet; then wash-drift with slight indications of gold, 2 feet; then arenaceous pipe-clay, 80 feet ("false bottom"); followed then by a layer of 2 feet of carbonaceous clay with Spondylostrobus and concomitant fossils; beneath this Silurian "bed-rock." Spondylostrobus-fruits were discovered by Mr. Johnston also in the Ophir Gold Mining Company's shaft (of the Launceston Tertiary basin), there sociated with Platycoila Sullivani, Phymatocaryon Mackayi and Conchotheca rotundata. The latter, it may be here passingly observed, has been traced in the Reform Company's claim, about ten miles from Ballarat, to a depth of 400 feet; and the same fossil or a closely allied species has latterly been noticed between Warwick and Towomba in the Clifton coal-mine by Mr. Simson, according to Mr. C. Staiger, F.L.S., Analytic Chemist to the Government of Queensland. There the succession of strata is as follows: 2 feet of volcanic black soil (the surface of the rich pastoral downs), then about 37 feet of Dolerite, after that about 43 feet of drift, on the bottom of which Conchotheca-fruits occur with fossilised wood and drift-quartz, and beneath this commences the coal, worked by the mine.

In Tasmania the Spondylostrobus is accompanied by the leaves of a tree, which possibly may belong to the order of Lauraceæ, unless indeed these showy leaves constituted the foliage of one of the local plants, described hitherto systematically from fruits alone. Mr. Johnston thinks, that he has recognized fragments of Spondylostrobus-foliage also in the Travertin near Hobarton as well as in the Windmill Hill beds near Launceston; there this fossil is likewise associated with the remains of an extinct Banksia, in all probability identical with the Victorian fossil congener. A variety of Spondylostrobus Smythii was rendered known under the name *cryptaxis* in the Report of the Department of Mines of New South Wales for 1878, p. 169, pl. III, fig. 1; in this aberrant form the valves are as long as the axillary body or even longer, which latter is completely concealed by them; they are separated by but very narrow interstices or become quite contiguous.

EXPLANATION OF LITHOGRAM.

PLATE XVI.

PLESIOCAPPARIS MEGASPERMA.—Fig. 1, fruit, presenting its side and base. Fig. 2, longitudinal section of fruit. Fig. 3, cotyledons separated, showing the radicle. Fig. 4, tissue of pericarp. Figs. 1–3, natural size; fig. 4, magnified 200 times diametrically.

SPONDYLOSTROBUS SMYTHII.—Fig. *5a*, impression of leafy branchlet, natural size. Fig. *5b*, summit of a branchlet, greatly enlarged, portions of the foliage restored.

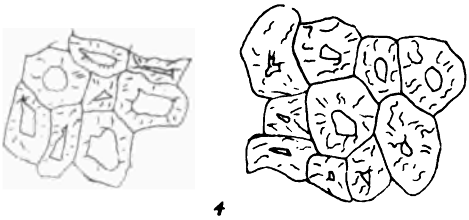
PLESIOCAPPARIS LEPTOCELYPHIS.

F. v. M. in Annual Report of the Department of Mines, New South Wales, 1876, p. 180, pl. IV., fig. 5.

Fruit comparatively small, slightly or seldom considerably depressed, somewhat oblique; pericarp very thin, outside almost smooth; seeds 2–4, small, unattached, oval or nearly roundish, very convex on the outer side, hollow and twisted on the inner side.

At Gulgong in the Upper Pliocene formation; C. S. Wilkinson, Esq.

Plate XVI



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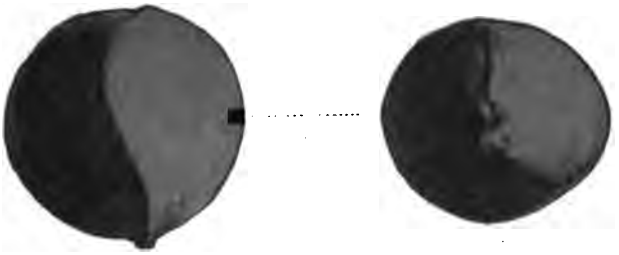

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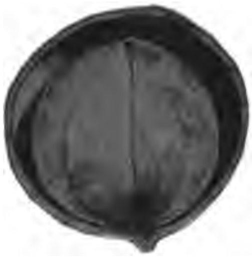

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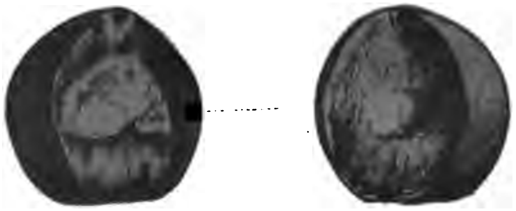

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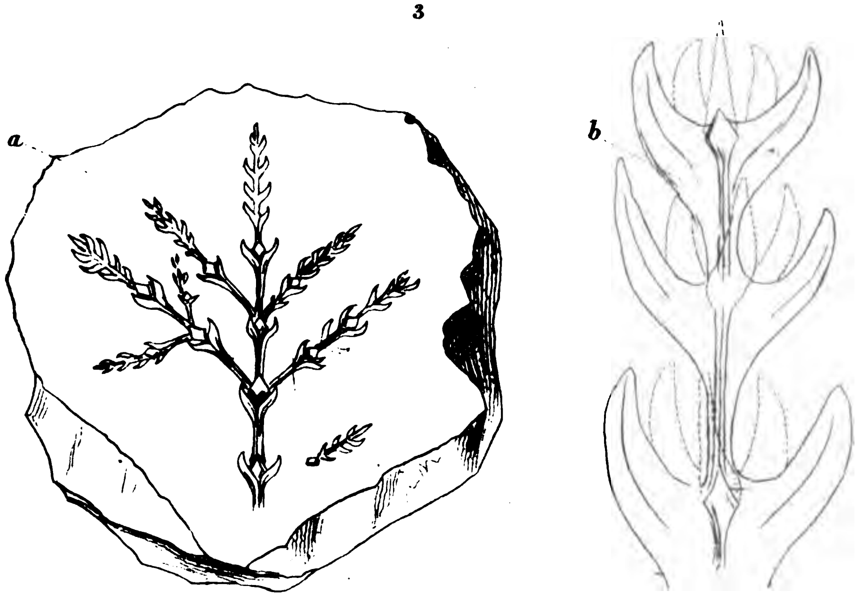


5.

R. Shepherd Del et Lith

Size of the fruit from ¾ to 1½ inch; the usually slight compression likely the effect of weight on an originally soft fruit; the pericarp outside very slightly rough from minute dots and rugosities, its general thickness about ½ line or not much more.

From the basal cicatrix, indicating an attachment to a hypogynous calyx, a faint angular line extending about half-way upwards on one side, this line terminating in a minute point, indicating possibly a lateral stigma or base of a deciduous style; this lateral line not clearly observable in all the specimens, yet none of them exhibiting a terminal apex; if the interpretation thus given should prove correct, then this fossil would be anomalous among Capparideæ. No traces of placentæ or septa observable, thus likely the seeds originally imbedded in pulp. Number of seeds preserved in the cavity, 2–4; their length from hardly ⅓ to nearly ½ inch; their flexure probably the result of exsiccation.

This is one of the many instances, in which the search for precise diagnostics, to define a fossil plant, proves unsatisfactory to a phytographer, accustomed to describe living plants and desirous of doing this conscientiously.

CONCHOCARYON.

F. v. M. in Reports of the Mining Surveyors and Registrars, December 1878.

Fruit hard, oblique-ovate, considerably compressed, one-celled, almost smooth, dehiscent only along the anterior margin, produced at the lower portion of the back into two acute ridges. Placenta narrow, dorsal in the cavity; its point of attachment to the seed about midway up at the dorsal inner angle of the pericarp. Seed solitary, ovate, turgid, filling the lower part of the cavity, extended at the summit into a flat short triangular appendage.

Name from some resemblance of this fossil fruit to a bivalved shell.

This genus must find its place among Proteaceæ, so far as we at present are able to judge; it approaches in the exterior form of the fruit some Grevilleas, but the pericarp is thicker than usual in that genus, although a few living species occur, in which the fruit-valves are as woody as in all Hakeas; the membranous terminal appendage indicates an affinity to the last-mentioned genus, from which however the lesser degree of the dehiscence of the pericarp removes it; the seed moreover is solitary, smooth and convex on both sides. Regarding fossil plants, the very unsymmetrical form of the fruit offers at once a mark of difference, by which this new genus can be separated from Conchotheca.

CONCHOCARYON SMITHII.

In drifts of the pliocene period at Gulgong.

I am not certain, whether the as yet unique specimen, on which the genus Conchocaryon is founded, came from the later collections of the Rev. W. B. Clarke or from those of Mr. C. S. Wilkinson, or perhaps from some other contributor and from a Victorian locality; but I believe to be correct in giving the above as the place of discovery and in regarding it contemporaneous with the many other fossil fruits, obtained from the auriferous drifts of our own colony.

Concerning the precise age of these fossils, opinions are as yet not quite unanimous. The eminent Nestor-geologist of Australia, whose death we had so recently to deplore, gave utterance to his view in the last (posthumous) edition of the "Sedimentary Formations of New South Wales (Sydney 1878)," p. 91, that they "seemed to belong to the *later* Pliocene period."

The figures on Plate XVII. give the natural size of the solitary specimen as yet obtained, little less than 1 inch in length. The pericarp is thick in proportion to the cavity, its walls being somewhat more than 1 line in diameter; the surface is but very slightly rough, acute on the anterior, obtuse on the posterior margin, a wide and deep furrow separating the two sharp keels towards the posterior base.

The seed, so far as I have been able to ascertain in an only specimen, is attached on the posterior side of the cavity from a point, where the summit of the nucleus passes into the terminal flat appendage. Nucleus measuring in length about ¼ of an inch, evidently longer than the wing of the seed. The circumscription of the genus may have to undergo some slight alteration in reference to the inner structure of the fruit, when more extensive material for dissection shall be at our disposal.

A vast number of supposed proteaceous plants are described by several palæontologists from the tertiary formations of different parts of Europe, but most of these were distinguished generically and specifically from leaves alone, often even without any real evidence of their belonging to this order of plants. Among the comparatively few, safely established as proteaceous from pericarps or seed, I notice none, which bears any close affinity to the particular co-ordinal fossil now rendered known.

By connecting the name of Major the Honorable W. Collard Smith, the Minister of the Mines Department, with this organic remnant of a pre-historic time, I desired to place on public record my grateful acknowledgment of his approval, to continue the distinct series of illustrations of vegetable fossils, commenced and carried on under the auspices of his honorable predecessors.

EXPLANATION OF LITHOGRAM.
PLATE XVII.

PLESIOCAPPARIS LEPTOCELYPHIS.—Fig. 1, side-views of fruit. Fig. 1*a*, a smaller variety of the same. Fig. 2, longitudinal section of a fruit. Fig. 3, seeds. All natural size.

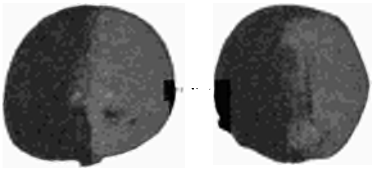
CONCHOCARYON SMITHII.—Fig. 4, lateral and dorsal view of a fruit. Fig. 5, longitudinal section of a fruit. Fig. 6, cellular tissue of the pericarp. Figs. 4–5, natural size; fig. 6, magnified diametrically 200 times.

ARAUCARIA JOHNSTONII.

F. v. M. in Reports of the Mining Surveyors and Registrars, September 1879.

Branchlets slender, dispersed; leaves very short, narrow- or linear-oblong, convex, slightly acute or rather blunt, not much spreading or almost appressed, few in each spiral coil; strobilus small, its terminal scales blunt and slightly truncated, the downward succeeding scales attenuated into a very short and narrow acumen.

Plate XVII



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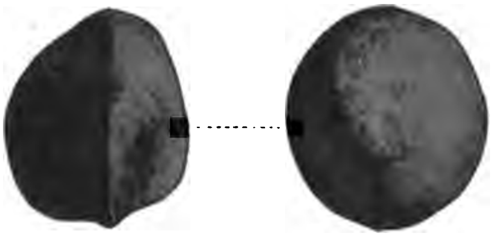

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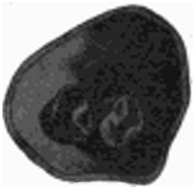

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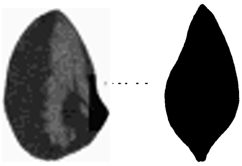

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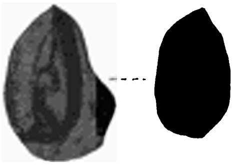

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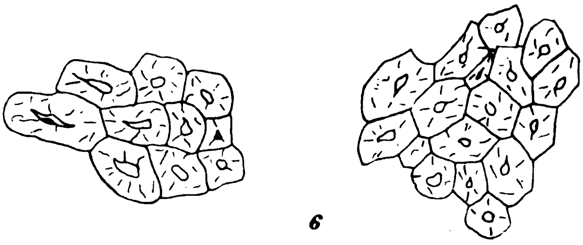


6

P. Shepherd Del et Lith.

In the Travertin of Geilston-Bay, Tasmania; Rob. M. Johnston, F.L.S.

The above curt definition circumscribes provisory a new conifer, of which impressions of branchlets and the summit of a fruit-cone were very recently found imbedded in the yellow tertiary freshwater-limestone near Hobart by the assiduous and circumspect amateur-geologist of Launceston, who observed this interesting coniferous fossil associated with fruits of the genera Penteune, Plesiocapparis and Platycoila. Noticing this association with congeneric and even perhaps conspecific types of plants from our Victorian Gold-drifts, I felt justified to admit this new fossil into the series of those, promulgated by the Department of Mines as pertaining to the auriferous drift-strata, although the tree now under consideration may not really be indicative of that formation. Mr. Johnston has argued with great lucidity on the geologic relation of this conspicuous fossil, now after ages for the first time disinterred by his searches; and I shall avail myself of his notes, to render the occurrence of this conifer rightly understood in its palæontologic meaning.

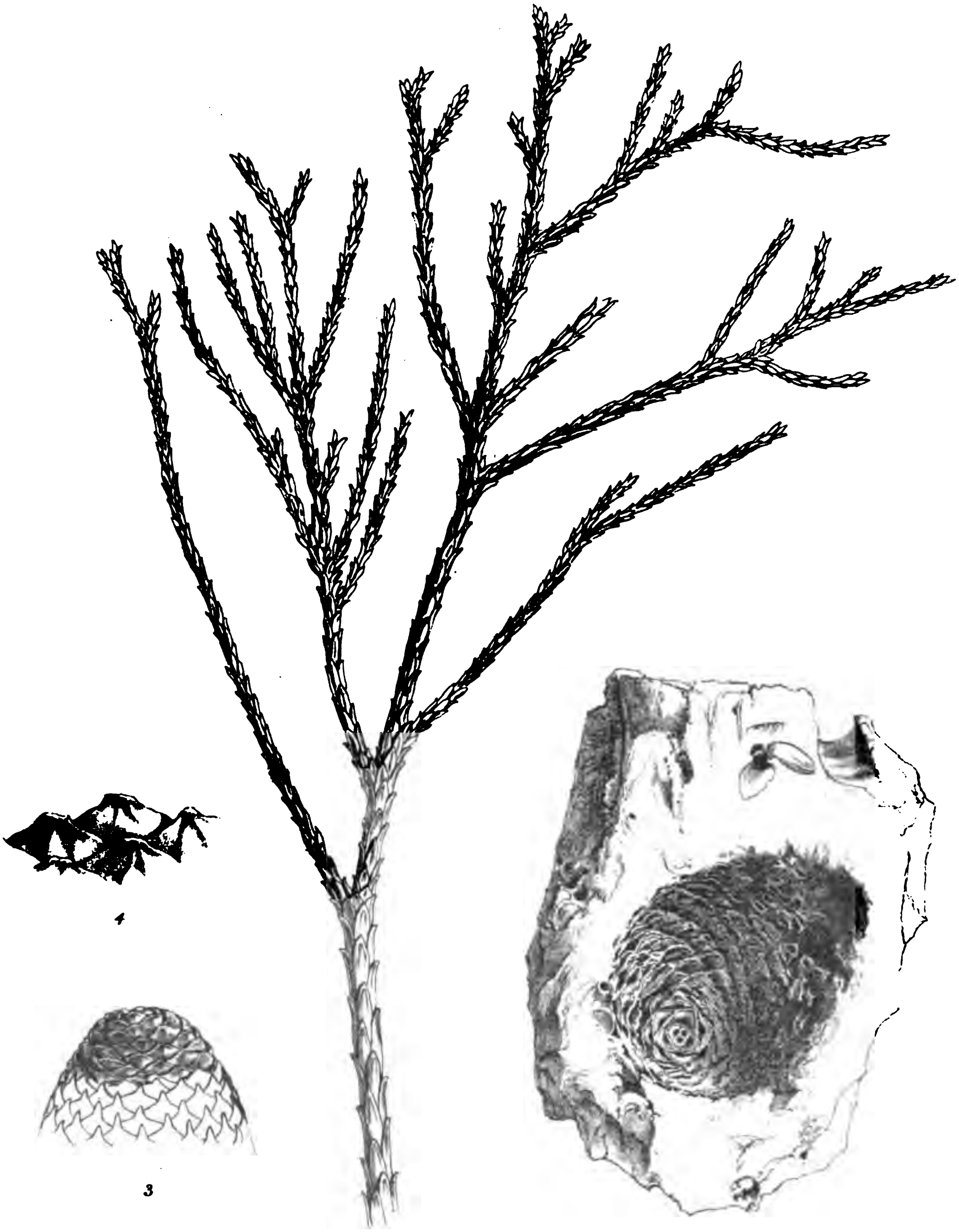
Before proceeding I wish it to be distinctly understood, that I placed with diffidence and hesitation this conifer of a bygone time in the genus Araucaria, as suggested by Mr. Johnston already. The impression of the solitary fruit-specimen hitherto obtained exhibits only the marks of the apices of the bracteal scales; hence the cardinal character of the genus Araucaria, as acknowledged in the living species of that genus, namely the consolidation of each nutlet with its two bracteal scales, has yet to be traced out for generic confirmation in the new fossil. The shortness of the leaves gives it also a somewhat different aspect, when compared to that of any living Araucaria, reminding rather among fossil plants of the foliage of Walchia, Voltzia, Echinostrobus and Palissya. Furthermore the shortness of the terminating acumen of the fruit-scales is not normal in existing Araucarias, although in A. Balansæ (Brogniart and Gris in nouvelles Archives du Muséum, Paris, VII. p. 206–207, pl. 13) it is also shorter than usual; and certainly in the fossil A. cretacea of France (as figured in Schimper's Paléontologie végétale, pl. LXXVI. 2), the scales are delineated as devoid of an acumen; but as the coalescence of the bracts with the nutlet is not demonstrated, the generic position of that fossil of the chalk-formation seems as yet not free from doubt. But other species of Araucaria have, as fossil, been admitted before in the work above quoted (tome II., 253–254), from fairly preserved fruit-remnants obtained in the oolithic formation of Britain; yet Carruthers was not fully convinced of their generic conformity and preferred to keep the English fossil species separate as Araucarites, which generic appellation might meanwhile be applied to the Geilston supposed congener also, although Schimper gave to that generic term recently again a different limitation.

If at all a comparison of the new fossil Araucaria with living species is admissible, it must particularly be with A. Cunninghami, from which it differs however in far more slender branchlets with far less leaves of each spiral turn, in the latter not being incurved (and perhaps also never dimorphous), in their remarkable shortness, in their apex being less pointed, and furthermore in much smaller fruits (if what we have hitherto seen of A. Johnstonii represents the fruit in an advanced state of growth), with scales extended into a much less elongated awlshaped-linear apex. In speaking here of Araucarias of the present day, it may be incidentally remarked, that the A. Muelleri (Br. and Gr., l. c. 219, pl. 15), represents the original A. Rulei, as xylographically illustrated by me in Lindley's Gardeners' Chronicle more than 20 years ago, and I may be allowed further to point out passingly, as concerning existing coniferæ, that the genus Belis (from βελος) well established already in 1807 by Salisbury (in the transactions of the Linnéan Society, VIII., 315–316), should in justice take precedence over Cunninghamia (R. Brown in L. C. Richard's Commentatio de Conifereis et Cycadeis, p. 149, t. 18, anno 1826), the name of the former genus being not more similar to Bellis, than that of Bassia or Brassica to R. Brown's Brassia.

The locality, where this fossil supposed Araucaria was obtained, is to us of classical interest. Already Charles Darwin visited it during the stay of H.M. ship *Beagle* at Hobart, and it was alluded to by that illustrious naturalist subsequently in his journal p. 448 (as well pointed out by Mr. Johnston) and also in his work on vulcanic islands p. 140 (as quoted by Sir Paul de Strzelecki, from a note of J. Morris, Physical Description of New South Wales and Van Diemen's Land p. 254). The last-named palæontologist moreover figured in Strzelecki's work several of the travertin-fossils from near Hobart, assigning to them a pliocene age (pl. VII. figs. 5–7), the leaf illustrated by fig. 5 representing the most abundant vegetable species in the sediment there according to Mr. Johnston, who however is inclined to consider these organic relics, notwithstanding the close affinity of some of them to forms of the present vegetation, as belonging to the miocene period, a view also taken by Professor McCoy, and to some extent supported by the late Rev. W. B. Clarke. Light on this special subject was thrown also by the late Morton Allport, who concluded from his local observations (Proceedings of the Royal Society of Tasmania, June 1876), that the intrusion and effusion of feldspathic Basalt has covered the travertin-bed, and (as shown also by Mr. Johnston) left to subsequent changes a portion of this freshwater-limestone as a superincumbent stratum, concealing bones of Phalangistæ and Hypsiprymni. Hence, as Mr. Allport puts it, the outflow of Basalt must have taken place earlier than the formation of the diluvium with its marsupial remnants, but must still be regarded of later date than that of the travertin with its vegetable fossils, to which latter now the Araucarian tree is added.

Professor Ulrich, as stated also by Mr. Johnston, considers the Basalt of Geilston-Bay and of similar geologic localities in Tasmania (coeval with what the latter calls the Launceston tertiary bed) identical with what in Victoria is often designated as the older vulcanic formation, which caps those fossiliferous layers belonging to a period, when Spondylostrobus-Cypresses and sapindaceous Phymatocaryon- and Penteune-trees leadingly with other now extinct silvan vegetation luxuriated over extensive portions of at least South-Eastern Australia and over very many parts of the now Tasmanian Island also. Mr. Johnston, with others, confirms, that the rich chocolate-colored soil in Tasmania, as in Victoria, is widely derived from feldspathic Basalt, and further that in auriferous and stanniferous regions it frequently overspreads the diluvial drifts, whereas the Augite-Greenstone,

Plate XVIII



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as pointed out by Professor Ulrich, has proved non-auriferous, wherewith often a clue is given for the likely success in operations of gold mining by clear scientific data.

Explanation of Lithogram.

Plate XVIII.

Fig. 1, branch with branchlets, restored from fragmentary impressions. Fig. 2, impression of the upper portion of a strobilus on travertin-stone. Fig. 3, the same restored to its natural appearance. Fig. 4, some of the upper fruit scales, in situ, much enlarged. Figs. 1–3, natural size.

PLEIOCLINIS.

F. v. M. in Reports of Mining Surveyors and Registrars, March 1882.

Fruit loculicidal, 7–9- rarely 6-valved, ovate-globular or ovate or rarely depressed-globular, of woody hardness, slightly tubercular-rough outside; valves thick, tardily and partially or often very imperfectly seceding from each other, mostly of permanent coherence towards the base. Free central axis none. Seeds solitary in each cell, usually few or even one only developed in each fruit, occasionally all missing; when well developed completely filling the cavity of their cell and pendent from its summit, oblique-ellipsoid, minutely apiculated, towards the hilum somewhat attenuated, fixed to a very short funicle; membranous appendage none. Raphe dorsal, partially seceding. Testa thin and smooth.

The generic name, composed of *πλεὶος*, more, and *κλινὶς*, couch, alludes to the comparatively numerous valves, on the cavities of which the seeds are embedded.

Pleioclinis Couchmanii.

In the middle pliocene drifts, overflown by lava, at Nintingbool and Haddon. The fossil plant, of which as yet the fruit only has become known, is dedicated to Major Couchman, who, as Secretary of the Mines Department of Victoria, has most readily promoted the palæontologic researches initiated by his predecessor. The specimens were mainly obtained through the circumspect assiduity of D. W. Spence, Esq., and are by no means of such wide occurrence as the fruits of Spondylostrobus Smythii, Phymatocaryon Mackayii, Penteune Clarkei and Celyphina MacCoyi. Locally the Pleioclinis fruits pass as "nutmegs" among the miners, so called from some fancied resemblance to the well-known spice-seeds of that name. As indicated in Major Shepherd's accurate lithographic drawings, the length of this fruit varies from hardly half an inch to rather more than one inch; the dehiscence is more definite at the summit than towards the base. Exceptionally a five-valved specimen may occur, this fossil then bearing great resemblance to Penteune trachyclinis, but exhibiting the characteristic narrower and less turgid seeds, which moreover occupy a longer space in the cavities, while besides the valves do not separate so readily. Thus as a genus Pleioclinis is distinguished from Penteune by the plurality of valves already, so far as in our present state of knowledge can be judged; but the great constancy of the number of fruit-valves in genera of Sapindaceæ and allied orders of the now living vegetation of the globe forbids incorporating this new species of fossil fruit in Penteune. Indeed the genus as now established was indicated, when a doubtful species was added to Rhytidotheca, R. pleioclinis (Observ. on new veg. fossils, I. decade, p. 20, pl. VI., fig. 1–4), that plant constituting in reality a second congener of Pleioclinis, which I now would wish to distinguish under the name Pl. Shepherdi, in appreciation of the services, rendered by Major Shepherd's artistic talent in illustrating so many fossil relics. The genus Rhytidotheca, as extended researches from additional material have proved, is to be restricted to Rh. Lynchii solely. The generic characteristic now given of Pleioclinis applies to Pl. Couchmanii mainly, from which Pl. Shepherdi differs in smaller size of fruit, in comparatively thinner valves, in their coherence at both extremities (though their lateral dehiscence is more perfect) and in comparatively narrower seeds.

OCHTHODOCARYON.

F. v. M. in Annual Report of the Department of Mines of New South Wales, 1878, p. 171, pl. IV., figs. 1–2.

Fruit large, globular or verging into an ovate form, outside very uneven from copious verrucular and scantily ridged prominences, inside smooth; pericarp of considerable thickness and almost of bony hardness. Septa none. Seeds unknown. Generic designation from *ὀχθωδης*, warty and *καρυον*, nut.

As the name implies, this genus of fossil plants approaches in outer verrucular roughness of the fruit to Phymatocaryon, while the large size, the valveless structure and the absence of dissepiments of the fruit bring the genus nearer to Plesiocapparis, from which again the roughness and greater hardness of the pericarp distinguish it. The outward resemblance of the nut to that of Xylocaryon is also very great, but from the cavity no ridgelike protrusions arise interjacent to the lobes of a large seed.

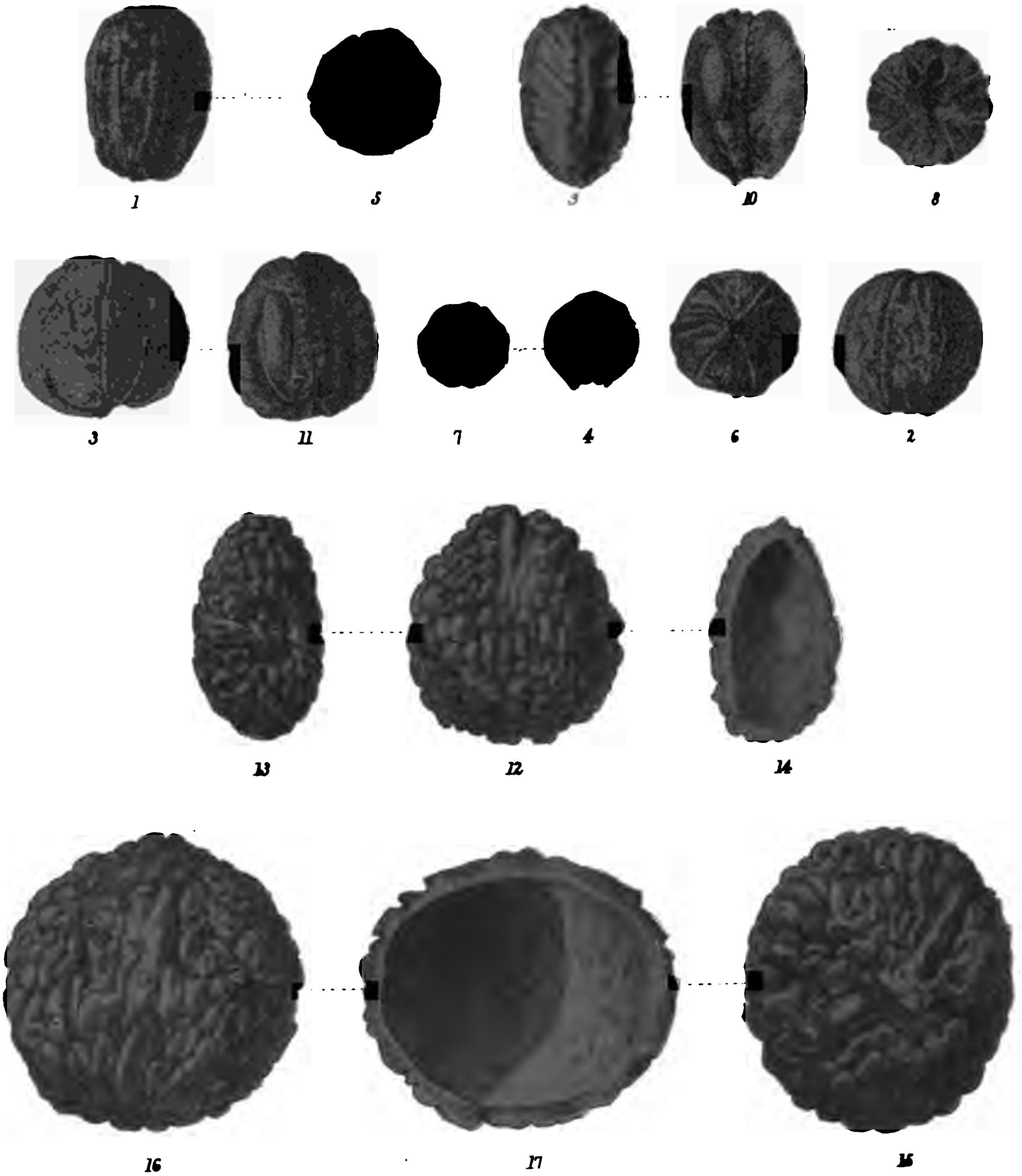
OCHTHODOCARYON WILKINSONII.

In the upper pliocene formation of Gulgong; C. S. Wilkinson, Esq.

Although this conspicuous fossil nut has not yet been found within the territory of the colony of Victoria, it was deemed desirable, to include it in the series of illustrations, explanatory of our pliocene flora, especially as this fossil plant of probably arboreous growth was coeval to the many other trees, the fruits of which have been rendered known through these Decades, and as in all likelihood the Ochthodocaryon will also yet be discovered in Victorian auriferous drifts.

It seems, that as yet no more specimens of this fruit have turned up, than the two delineated on plate IV. of the Report of the New South Wales Mines Department for 1878. Hence the ordinal location of this genus, in our present unacquaintance with the characteristics of the seeds, remains still unsettled.

Plate XIX



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Explanation of Lithogram.

Plate XIX.

Pleioclinis Couchmanii.—Figs. 1–4, side-view of reversed fruits. Fig. 5, fruit seen from above. Figs. 6 and 7, fruits seen from below. Fig. 8, transverse section of a fruit. Figs. 9–11, longitudinal sections of reversed fruits.

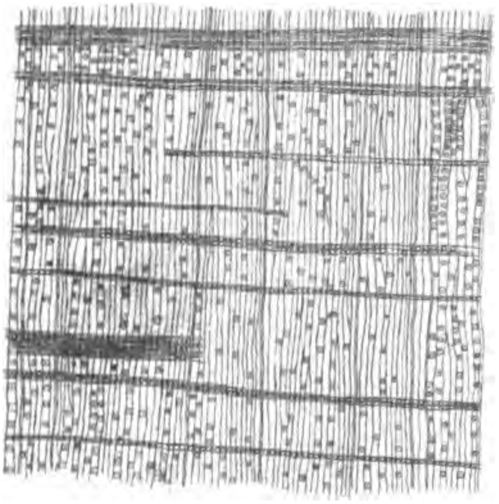
Ochthodocaryon Wilkinsonii.—Figs. 12 and 15, side-view of fruits. Figs. 13 and 16, fruits seen from below. Figs. 14 and 17, longitudinal section of fruits.

In concluding the carpologic definition of fossils for the second decade of these plants, it will be desirable to place on record, what in the course of the last dozen years through accumulation of larger material has been ascertained in reference to additional characteristics of the fruits hitherto illustrated. Spondylostrobus Smythii; fruit-specimens were collected by Mr. Spence, near Ballarat, quite conically attenuated, the valves proceeding from near the base, ceasing however at two-thirds of the height of the fruit; a six-valved variety occurs of less than one inch measurement, while also forms have been met with considerably larger than any at first illustrated. Celyphina MacCoyi presents occasionally fruits of nearly two inches measurement, and a pericarp of fully half-inch thickness; the attachment of the ovules is parietal; hence it would seem, that no dissepiments are developed evanescent in age. When the Celyphina-fruits are so large and so roundish, as to resemble externally those of Plesiocapparis prisca, a distinctive difference may still be noted in their proportionately thicker pericarp and comparatively smaller cavity. Penteune Clarkei fruits have also been found quite two inches long, and Phymatocaryon Mackayi fruits have likewise been gathered fully one and a half inch long, the latter continuing their characteristic roughness, thus abnormal four-valved forms of either remaining readily distinguishable. Platycoila Sullivani exhibits not always the first noted valvular structure of the fruit, though the described dehiscence seems not to have been accidental. Rhytidotheca Lynchii produces as many as four ovules in one cell; the well-ripened solitary seeds become at each extremity elongated into a winglike membrane. Conchotheca rotundata seems to have its fruit laterally affixed to a stipes, as is the case with many Grevilleas, the place of communication with the pericarp being near the middle of the posterior side; the well-developed seed completely fills the cavity, is flat-compressed, almost truncate at one extremity and slightly apiculate at the other; the testa is membranous, minutely rough from granular elevations, which are mostly arranged in short lines, giving to the outside of the seeds a pretty appearance. Penteune trachyclinis produces occasionally two seeds in each cell, the upper extremity of the lower seed and the lower end of the upper seed truncate. Specimens of Dieune pluriovulata, sent from Lal-Lal by Prof. Krause, show one seed finally filling the cavity of the fruit. Mr. J. Milne Curran, in collecting fruits of Spondylostrobus Smythii, Phymatocaryon Mackayi, Ph. angulare and Penteune Clarkei near Dubbo, has demonstrated, that forests of these trees in pliocene times extended to what forms now the valley of the Upper Macquarie-River. From the matrix, in which fossil fruits of various kinds were embedded near Ballarat, Mr. Spence obtained also detached remnants of leaves, which however could not be traced to any of the particular species of those plants, whose names in these pages originated from carpologic investigations solely.

SPONDYLOSTROBUS SMYTHII.

The huge fossil stems with remarkably light and fissil wood, noticed in the auriferous drifts at Haddon, are assumed by the writer to belong to Spondylostrobus, with the fruits of which this wood is there associated. Professor Ferd. Krause, the accomplished Geologist and Mineralogist to the School of Mines at Ballarat, forwarded chips from a stem, which was upwards of three feet in diameter, where laid free by the drive of a mine. Anatomic examination, as now shown, places the tree, yielding this wood, in the series of Cupressinous Conifers, as defined histologically by Dr. H. R. Gœppert, Director of the Botanic Garden of Breslau, who in his grandly scientific establishment for a long series of years has traced also the connections between the fossil and living species of Coniferæ from arboreta as well as museum-material. In his "Monographie der fossilen Coniferen," issued in 1850, and in his "Revision der Arbeiten ueber die Stæmme der fossilen Coniferen," published last year, he describes the tribe of Cupressinæ xylo-logically as follows: "Margined dots in the tracheidæ, forming simple rows; smaller uniform edgeless dots in the medullary rays; resin-ducts simple,"—in contrast to Araucarieæ with: "Dots of tracheidæ closely approached in simple or double spiral rows; dots of medullary rays very small and usually edged" (the Pinaceæ, Taxaceæ and Gnetaceæ requiring no allusion on this occasion). We have neither in the locality, where the coniferous stem was unearthed, nor as far as known elsewhere in Australia any fossil cupressinous trees coeval with Spondylostrobus; inasmuch as the conifer from the Travertin of Tasmania belongs to the tribe of Araucarieæ, indeed in all probability to the typical genus Araucaria, and as such it was described and illustrated in the 3rd Quarterly Report of the Department of Mines for 1879. What relation a very similar conifer, placed by Dr. Feistmantel doubtfully into genus Brachyphyllum (Palæontographica 1880, p. 97-99, t. vii. fig. 3-6), may bear to Araucaria Johnstoni, further researches must prove, when well-developed fruits and also the stems of both shall have been discovered. The supposed Brachyphyllum came from a clay-band in an isolated coal-seam of Lithgow-valley, New South Wales. It seems very near to Araucaria and not congeneric to the genuine Brachyphyllum mamillare (Brogniart) of the oolithic formation in Britain. To the admission of these two fossil species of Coniferæ into Araucaria can be the less

Plate XX



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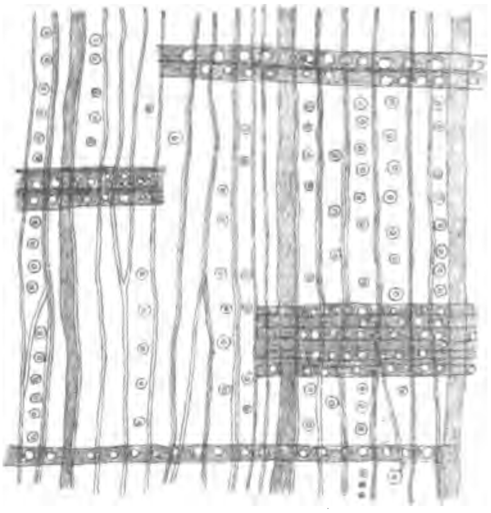

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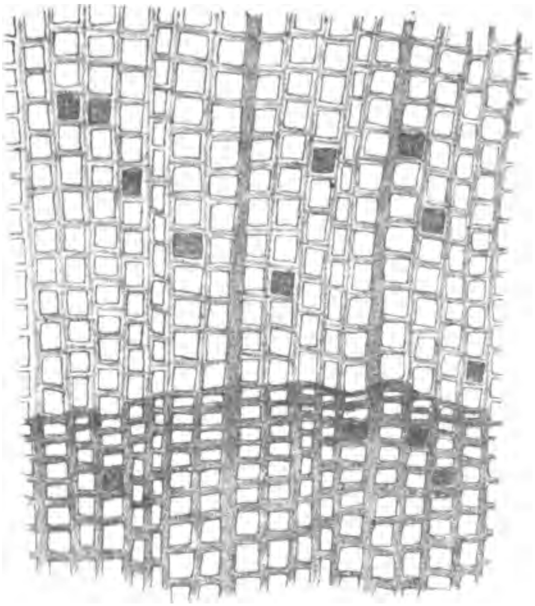

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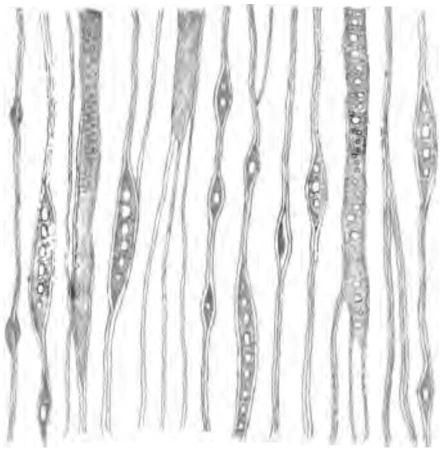

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objection, since J. St. Gardner was led by his researches ("Nature," 1880, p. 199-202), to extend the limits formerly assigned palæontographically to that genus, and as Lesquereux has traced true Araucarias to the Triasic, Carruthers to the Jurassic, and lastly Gardner to the eocene epoch.

EXPLANATION OF LITHOGRAM.

PLATE XX.

SPONDYLOSTROBUS SMYTHII.—Fig. 1, radial section of aged stem-wood, exhibiting in horizontal lines the medullary rays, and in vertical lines the woody fibres, diametrically 30 times magnified. Fig. 2, radial section, diametrically 120 times magnified, as in the two following sections. Fig. 3, transverse section of wood, exhibiting in regular quadrangular spaces the walls and cavities of woody fibres, in long dark lines the medullary rays, and in scattered dark spots the resin-ducts, the transverse darker shading indicative of the limits between two sets of annual growth. Fig. 4, tangential section of wood, with groups of medullary rays transversely cut, and with vertical lines and spaces of woody fibre.

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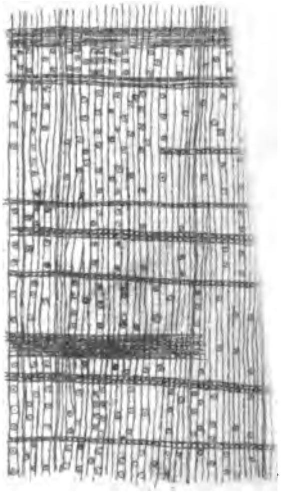

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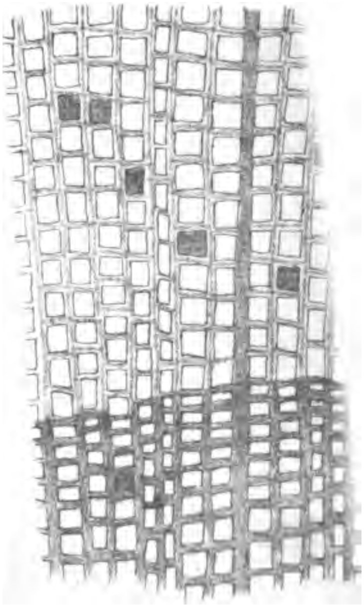

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